

memorandum

DATE: September 23, 1985

REPLY TO: Office of Fisheries Assistance, Fish and Wildlife Service, Panama City,
ATTN OF: Florida

SUBJECT: Fish Kill Investigation - St. Vincent National Wildlife Refuge, Apalachicola, Florida

TO: Refuge Manager, St. Vincent National Wildlife Refuge, Apalachicola, Florida

On September 16, 1985, the Panama City Office of Fishery Assistance responded to a request from Mr. Jerry Holloman, Refuge Manager, to investigate and determine the cause(s) for a fish kill occurring in nearly all of the ponds located on St. Vincent National Wildlife Refuge.

Observations

Two days (9-16 and 9-18-85) of field investigations indicated that sportfish (largemouth bass, Micropterus salmoides, bluegill sunfish, Lepomis macrochirus, redear sunfish, Lepomis microlophus and striped mullet, Mugil cephalus) populations had been partially or completely eliminated in 5 of the 6 ponds managed for sportfishing. Standard sampling techniques were utilized to determine the extent of the loss of sportfish in each of the ponds. The magnitude of the fish kill is as follows:

<u>Site</u>	<u>Acreage</u>	<u>Condition of Sportfishery</u>
Oyster Pond	104	100% loss
Pond 1	28	100% loss
Pond 2	24	100% loss
Pond 3	34	100% loss
Pond 4	35	90-95% loss (est)
Pond 5	34	fishery intact

Spotted gar, Lepisosteus oculatus and mosquitofish, Gambusia affinis were the only fish found living in the effected habitat.

The ponds range in depth from 4 to 7 feet with an average depth of 3 feet. Heavy stands of cattails border each pond. In addition, most of the ponds have dense growths of chara, coontail, widgeon grass and American lotus. The water is tanic in color. Pond level maintenance is dependent upon precipitation.

Discussion

The limnological investigation indicated extremely poor water quality in the effected ponds. Surface dissolved oxygen (D.O.) levels ranged from 1.0 to 4.0 ppm (9-16-85). D.O. measurements were taken several days after the fish kill occurred however, readings were most likely lower at the time of the fish kill occurred (3 ppm D.O. stresses most inhabitants of the aquatic

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ST. VINCENT NATIONAL
WILDLIFE REFUGE

community). In addition, bottom mud samples indicated the absence of invertebrates which would suggest that D.O. was insufficient to maintain these bottom communities.

The amount of aquatic vegetation occupying the ponds is at a critical level. Several cloudy, windless days would rapidly deplete the amount of available D.O. in the system.

Thermal and D.O. stratification had taken place in the ponds prior to the fish die-off. Stratification is a natural occurrence. Cooler temperatures and lower D.O. readings are usually found on the bottom of the pond. The warmer, more oxygenated water is in the upper portion of the pond. Cooler weather causes the upper portion of the pond to become more dense than the bottom portion of the pond. Subsequently, the unoxygenated bottom layer of water replaces the oxygenated layer of water or what is known as lake "turn-over" occurs. Lake "turnovers" are triggered by seasonal changes in temperature, cool rains and high winds.

St. Vincent NWR experienced cool rains (12 inches) and high winds (in excess of 100 mph) during Hurricane Elena. A lake "turnover" most likely occurred at this time. The period following the storm was partly cloudy, hot and no wind. The natural replenishment of oxygen to the system was lost - thus a fish kill occurred. In addition, the high winds may have disturbed the bottom sediments in the shallow ponds so as to further reduce the available oxygen. High salinity was most likely the contributing factor in the fish kill in Pond 1. A tidal surge caused by Hurricane Elena increased the salinity levels in Pond 1 (salinity measured in Pond 1 - 6 ppt on 9-18-85, salinity was most likely higher at the time of the fish die-off; salinities of 4 ppt adversely effects freshwater organisms).

Pond 5 was the only pond not experiencing a fish kill. Pond 5 has the least amount of aquatic vegetation in the system and diurnal fluctuations in D.O. would be minimal. In addition, Pond 5 is the most interior of the refuge ponds and did not receive the full impact of the hurricane winds. Furthermore, Pond 5 represents the headwaters in the chain of ponds and may contain a spring source that maintains adequate D.O. levels in the pond.

Recommendations

1. Close St. Vincent NWR to sport fishing until further notice. (Ponds should be ready to fish 18 months after stocking largemouth bass fingerlings)
2. Reduce the water levels in Oyster Pond, Ponds 1, 2, and 3 and conduct a fish eradication program to eliminate the remaining trash fish populations.
3. Restock with hatchery reared bluegill/redear sunfish fingerlings at 500 fish per acre in the fall of 1986. Efforts should be undertaken to preserve the unique quality of the bluegill sunfish ("hand painted") found on St. Vincent NWR. It is recommended that bluegill broodstock be obtained from Pond 5 and transferred to Welaka NFH for spawning, rearing and subsequent stocking back into the system. Stock largemouth bass fingerlings at 100 per acre in the spring of 1987.

4. Conduct additional fish surveys in Pond 4 to determine if existing fish populations are at a level that complete eradication would be beneficial to the sport fishery at this time.
5. Initiate aquatic vegetation control programs utilizing approved herbicides and/or mechanical methods.
6. Utilize dredging techniques to remove bottom sediments, provide deep water habitat and control aquatic vegetation.
7. Initiate regular investigations of water quality throughout the system.

Attachment

cc:

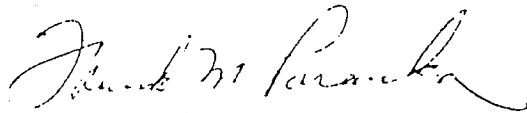
Regional Office, Fishery Resources (South), Atlanta, GA

Regional Office, Wildlife Resources, Atlanta, GA

Hatchery Manager, NFH, Welaka, FL

FP

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A handwritten signature in cursive script, appearing to read "Robert M. Parker".

St. Vincent NWR, FloridaWater Quality Analysis

September 16, 1985

	<u>Pond #3</u>	<u>Pond #4</u>	<u>Pond #5</u>	<u>Channel By Cabin</u>	<u>Outlet Creek</u>	<u>Gulf</u>
Time (CST)	2:00 pm	10:10 am	10:30 am	9:45 am	9:30 am	9:30 am
Dissolved Oxygen (ppm)						
Surface	4.0	1.5	5.0	1.0	1.0	---
bottom	4.0(3 ft.)	---	5.0(5 ft.)	---	---	---
pH surface	6.7	6.7	6.3	6.3	6.7	---
bottom	6.3	---	6.7	---	---	---
Temperature (F ^o)						
surface	81.7	76.3	76.1	73.6	73.4	70.3
bottom	78.1	75.7(4 ft.)	75.4	---	---	---
Salinity (ppt)						
surface	.22	.5	.12	.3	.5	8.7
bottom	.28	.5	.23	---	---	---
Conductivity (umhos/cm)						
surface	360	700	200	---	900	13,400
bottom	300	700	300	---	---	---
Carbon Dioxide (ppm)	---	---	17.5	---	32.0	---

Weather - Sunny, warm, variable winds - air temp. - 85^o F

St. Vincent NWR, Florida

Water Quality Analysis

September ¹⁸~~16~~, 1985

	<u>Oyster Pond</u>	<u>Pond #1</u>	<u>Pond #2</u>	<u>Pond #3</u>	<u>Pond #4</u>	<u>Pond #5</u>
Time (CST)	8:25 am	11:00 am	11:30 am	12:05 pm	2:00 pm	1:30 pm
Dissolved Oxygen (ppm)					3.0 (East)	
Surface	1.0	1.5	3.0	4.0	6.0(channel)	---
bottom	1.0(3 ft.)	1.5(3 ft.)	2.0(3 ft.)	---	2.0(6 ft.)	---
pH surface	6.9	6.9	6.8	---	---	---
bottom	---	6.8	6.9	---	---	---
Temperature (F ^o)						
surface	75.2	77.9	77.9	80.6	82.4	79.7
bottom	75.2	77.4	77.0	77.9	77.4	77.4
Salinity (ppt)						
surface	1.25	1.0	.8	.8	1.0	.75
bottom	1.5	6.0	1.0	1.1	1.1	.8
Conductivity (umhos/cm)						
surface	2200	1500	1320	1100	1680	1080
bottom	3400	10,800	1640	1350	1850	1120
Hydrogen Sulfied (mg/l)						
	0	0	0	0	0	0

Weather - Sunny, warm, variable winds - air temp. - 85^o F

Feb 1970

Low water periods will prohibit the use of these cr. sport fishing on the ponds will cease during the periods to lack of access. Due to these conditions, we have termed this "primitive fishing". These conditions should naturally restrict the number of people fishing these ponds to the sportsmen who sincerely enjoy the sport and are willing to work for it. In the event that future fishing pressures should increase to a point of seriously affecting the fish populations, then consideration may be given to permitting a predetermined number of fishermen to fish only on designated days.

The refuge manager's suggestion of retaining the fresh water fishery as a primitive area, i.e., as near as possible to the present condition, is an excellent one. Under this concept outboard motors will be prohibited on the ponds.

The bluegills in the six fresh water ponds are of the variety known locally as hand-painted bream, pied-bream or spot. An unpublished report by Dr. Melvin T. Huish, University of Georgia, states that this undescribed variety exists in the Apalachicola River watershed and its tributaries. Dr. Huish indicates that the specimens he has collected have melanistic areas which are variable in size and irregular in configuration. The males are more brilliantly colored than the females.

From the information available, it would appear that this variety of bluegill is unique to the Apalachicola River watershed. Specimens are known to have been collected as far north as the Flint River, a major tributary of the Apalachicola River. However, the specimens from the Flint River area are reported to be less colorful than those found in the lower watershed. In view of this, it is felt that the population of this variety existing in the fresh water ponds on St. Vincent Island should be maintained in an uncontaminated state. Accordingly, it is recommended that no future stocking of bluegill be made on the island. OK

An item of interest, though not associated with the fishery, is the presence on the island of an estimated 75 to 100 sambar deer along with whitetail deer. The sambar deer are descendants of one buck and three does stocked in 1908 by Dr. Ray V. Pierce, a former owner of the island. The fishery survey team was fortunate in seeing a large buck feeding near one of the lakes during the survey.

Jerry,
Thought you
might be
interested in
this
report.

A COLOR VARIATION OF THE BLUEGILL
SUNFISH, *Lepomis macrochirus*

MELVIN T. HUISS

School of Forest Resources, University of Georgia, Athens

Bluegills (*Lepomis macrochirus*) having different markings than those found among "normal" populations exist in the Apalachicola River, Florida, and some of its tributaries. Although these fish have been known locally as the hand-painted bream, pied bream and/or spot for many years, it has not been reported in the literature. Specimens collected have melanistic areas which are variable in size and irregular in configuration. These black areas appear on either or both of the lateral surfaces of smaller and larger males (Fig. 1) and less conspicuously, on females. The number of spots varies from one to several on each fish. In some males there are further differences. These include a more extensive black spotting than found on females and a dark red coloration which extends from the head to the caudal peduncle dorsad of the lateral line. Also there exists on some adult males a yellowish color dorsad to the ventral fin.

Fish from the Flint River, Georgia, a major tributary of the Apalachicola, have the melanistic markings but are less colorful than those from portions of the Apalachicola River. Colorful specimens are reported by local guides and members of the Florida Game and Fresh Water Fish Commission to occur in such tributaries as Dead Lakes, Browns Lake, Porter Lake, Florida River, River Styx, Whites River, Chipola Cutoff, Bearman Creek and Lake Wimico. Their presence in two small lakes in the town of Wewahatchka, Florida, was also reported by local residents but confirmation was not obtained in 1963 collections. Conspicuously marked and normal specimens were collected from the Dead Lakes, White River and Lake Wimico. Collections in 1969 from the freshwater ponds on St. Vincent Island National Wildlife Refuge showed this variety to occur there also.

Five (2 males, 3 females) of the marked fish from the Dead Lakes and Lake Wimico were transported and stocked in a 0.3-acre pond, devoid of fish, at the University of Georgia School of Forest Resources, Whitehall Fishery Research Station, on April 16, 1965. These brood stock were not considered to be as heavily marked nor as colorful as some other specimens taken at the same time from Lake Wimico. On May 4, 1968, the pond was drained. Of a total of 1575 bluegill recovered, 12% (192) possessed one or more black spots on their sides and were more highly colored than the other fish in the pond. Thirty-five of the conspicuously-marked fish and two less well marked were released into another pond having no bluegill. Six males only were removed at the time of draining in May, 1969. No reproduction had

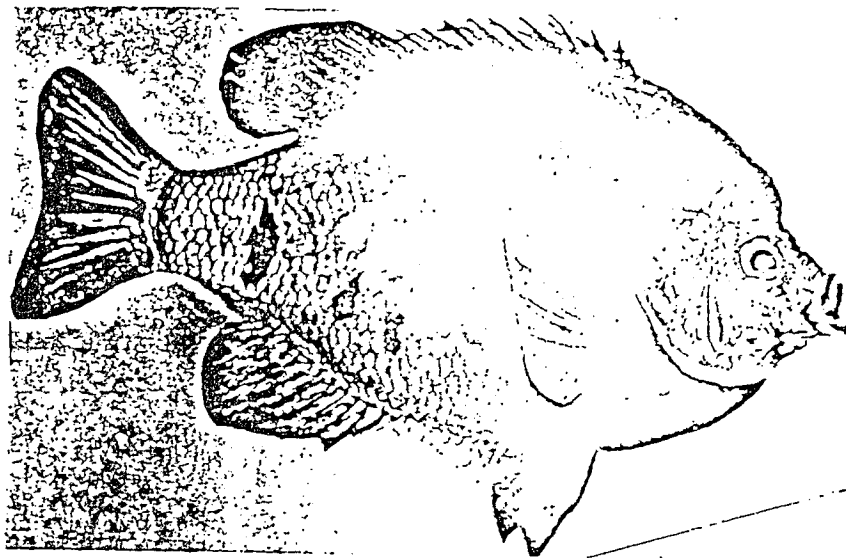


FIGURE 1

Adult male color variant of the bluegill.

occurred in the pond, and it is assumed only males were selected and stocked. In the spring of 1970 one large adult male having the distinctive marks was captured in a wiretrap from the North Fork of the Oconee River near the outlet of the Whitehall ponds. Since anecdotal evidence from sport fishermen also exists regarding a "different" sunfish in the Oconee River, it is believed this strain may now occur in this drainage area. Providing future collections do show their presence in the river, studies of the dispersal of this genetic factor in fish populations from such an environment will be possible.

Conclusions regarding the low frequency of occurrence of the marked fish are not drawn as a result of this brief study. However since predacious fish were not present in the pond, environmental selection against marked fish from that source did not take place. Further studies to determine the genetic nature of the marks are contemplated. The presence of the marks more conspicuously on the males (immature as well as mature) may offer the basis of sexual selection of these fish at young stages. Such selection would permit studies of monosexual production of this species.

ACKNOWLEDGEMENTS

Several persons and agencies were instrumental in collecting and locating specimens. Without their efforts this work would not have been performed. Among them were James Barkuloo and Edward Crittenden of the Bureau of Sport Fisheries and Wildlife, and Herbert Wyatt formerly with the Georgia Game and Fish Commission.

Appendix B. St. Vincent Island Water Chemistry at various locations on 12/9/85

	Lake #1	Lake #2	Lake #3	Lake #4	Lake #5	Outlet Channel (Bridge)	Oyster Pond	Oyster Outlet Channel (Dune Line)
Time (CST)	11:30AM	11:15AM	10:30AM	9:15AM	9:35PM	12:40PM	2:25PM	2:45PM
Dissolved Oxygen (ppm)								
surface								
bottom								
ph								
surface								
bottom								
Temperature (F°)								
surface								
bottom	60.8	62.6	61.7	59.9	60.8	62.6	62.6	67.6
Salinity (ppt)								
surface								
bottom	4.3	4.5	3.5	0.2	0.25	2.0*	2.0	1.5-3.0**
Conductivity (umhos/cm)								
surface								
bottom	5500	5800	5500	550	450	3500	3500	4000

Weather - Sunny, warm

* Soon after tide began flowing inland

** At same time Gulf waters were 68.9°F and 29 ppt salinity just a few feet south of dune line.